

University of Rhode Island  
College of Education and Professional Studies  
School of Education

**EDC 430 Methods and Materials in Secondary Teaching and Practicum Experience for Secondary Mathematics Education (3)**

**EDC 431 Clinical Experiences in Secondary Education III (1)**

**MTH 391 – Special Problems (independent study) (1)**

**Fall 2016**

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Office Hours: T 1:30 – 3:30 and by appointment

Class location: Chafee 251

EDC 430 - 3 credits, EDC 431 - 1 credit, MTH 391 – 1 credit

Office: Chafee 709

Office phone: 874-4149

Secretary: Ms. Marsha Mott 874-4068

Meets: Tuesday 3:30 – 6:15 pm

**Course Information**

Catalog Description:

EDC 430-Principles of education as related to curricular materials and classroom situations. Sectioned by academic major: English, mathematics, modern language, science, social studies. Not for graduate credit in education. (3 credits.)

EDC 431-Secondary school clinical experience, taken concurrently with secondary methods course (430) during the semester prior to student teaching. Candidate applies content learned in methods course and prior coursework to peer teaching and classroom settings. Not for graduate credit in education. (1 credit.)

MTH 391-Special Problems (independent study) In this course we will study the secondary mathematics curriculum.

In MTH 420 you will deepen your mathematical content knowledge of the secondary curriculum through problem solving, reasoning, communicating, connecting, and representing mathematics.

Prerequisites: EDC 102 and EDC 250 and senior standing or permission of instructor. Concurrent enrollment in EDC 430 and 431 required. Open only to secondary education majors and secondary MA/TCP students.

Relationship to Professional Preparation:

EDC 430, EDC 431, and MTH 391 are an important part in your transition from URI student to professional teacher; therefore, the lessons learned and the collegial relationships made in these courses will not only pay off for a grade in them, but also serve you well in your future as a Secondary Mathematics teacher. In EDC 430 you learn about HOW to teach, in MTH 391 about WHAT to teach, and in EDC 431 you begin to learn to implement this knowledge in PRACTICE and REFLECT on your learning. Key requirements in these courses include *investigating and evaluating* secondary mathematics curriculum materials and maps, *planning* and *implementing* lesson plans, *reflecting* on your work and practice, *professional involvement* in your student teaching classroom(s), *membership* in one or more professional associations, and the successful completion of a *Unit Plan*.

In order to earn a "recommendation to student teach" teacher candidates must:

1. Earn a "meet or exceed" designation for each criteria of the unit plan assignment (EDC 430) and successfully upload this assignment to the TaskStream E-folio system (<http://www.taskstream.com>);
2. Earn a "recommendation to student teach" from both the cooperating teacher and the university supervisor in pre-student teaching practicum evaluation(s) (EDC 431);

3. Address any areas in need of improvement if "recommendation with reservations" is noted by the university supervisor and/or cooperating teacher(s);
4. Complete all other program requirements (including earning an overall GPA of 2.5+, 2.5+ in Education, and 2.5+ in Mathematics coursework, complete a TB test and BCI (criminal background check, valid for the whole year);
5. Show evidence of a passing score on the Praxis II: Principles of Learning and Teaching test prior to the last day of the fall semester;
6. Show evidence of a passing score on the Praxis II: Mathematics Content Knowledge test prior to the last day of the fall semester;
7. Obtain a RI State Student Teaching Certificate;
8. Earn an "S" in EDC 431 from the university supervisor in the final evaluation;
9. Submit and complete all course assignments (EDC 430/431 and MTH 391) and the Pre-Student Teaching Checklist and Log (signed by the cooperating teacher, EDC 431);
10. Earn a C or higher in EDC 430 and MTH 391; and
11. "Meet or exceed" all criteria, including each NCTM teaching standards and RIPTS standards, on the performance-based Unit Plan (EDC 430)

### **Course Texts and Materials**

Nearly all handouts and materials for the course will be available electronically only via the following wikispace: <http://edc430-03.wikispaces.com>

Support for student teaching and related documents and materials will be posted on the following wikispace: <http://secondary-mathematics-uri.wikispaces.com/TURISME+Home>

#### **Required:**

1. Chazan, Daniel (2000). *Beyond formulas in mathematics and teaching*. New York, New York: Teachers College Press. Available at [https://www.amazon.com/gp/offer-listing/0807739189/ref=dp\\_olp\\_used?ie=UTF8&condition=used](https://www.amazon.com/gp/offer-listing/0807739189/ref=dp_olp_used?ie=UTF8&condition=used) or here: <http://www.abebooks.com/book-search/isbn/0807739189/>
2. Current membership in a professional association (Your home state's organization, e.g. RIMTA in RI). Acceptable evidence of membership can be provided in the form of a photocopy of a membership card or a photocopy of the journal cover with your address label or an e-mail confirmation notice. *This evidence is due by midterm*. Student Membership form and information for the Rhode Island Mathematics Teachers Association (RIMTA) can be found here: <https://sites.google.com/site/rimtamath/home/membership>.

#### **Suggested:**

1. Posamentier, Alfred S., and Jay Stepelman (2005). *Teaching Secondary Mathematics*. Pearson Education.
2. Rubenstein, Rheta N., Charlene E. Beckman, and Desisse R. Thompson (2004). *Teaching and learning middle grades mathematics*. Emeryville, CA: Key Curriculum Press.
3. Artzt, Alice F., and Eleanor Armour-Thomas (2002). *Becoming a reflective mathematics teacher: A guide for observations and self-assessment*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
4. Posamentier, Alfred S., and Herbert A. Hauptman (2006). *101+ Great ideas for introducing key concepts in mathematics: A resource for secondary school teachers*. Corwin Press.
5. Posamentier, Alfred S., (2003). *Math Wonders to Inspire Teachers and Students*. Association for Supervision and Curriculum Development.
6. Secada, Walter G., Elizabeth Fennema, and Lisa Byrd Adajian, Eds., (1995). *New directions for equity in mathematics education*. New York, NY: Cambridge University Press.

7. Ascher, Marcia (2002). *Mathematics elsewhere: An exploration of ideas across cultures*. Princeton, NJ: Princeton University Press.
8. Moses, Robert P., and Charles E. Cobb, Jr. (2001). *Radical equations: Math, literacy, and civil rights*. Boston, Mass: Beacon Press.

#### Materials:

- A free account and Evernote app with [www.evernote.com](http://www.evernote.com) including the free Webclipper and Skitch annotation app.
- A free account with [www.educations.com](http://www.educations.com)
- Graphing Calculator or graphing calculator app. In the course, I will mostly use the TI-84+.
- Geogebra. You can find this at: <http://www.geogebra.org/cms/> Geogebra is also available as a free app for mobile devices. Geogebra also runs as a web-based application.
- In addition, I recommend a ruler, protractor, and two differently colored pens or pencils.

#### **Measurable Course Outcomes**

Grounded in the University of Rhode Island, School of Education's conceptual framework that is based on the Rhode Island Professional Teacher Standards (RIPTS) and based on current professional standards for professional secondary teachers of mathematics, the following course objectives will be demonstrated by all successful teacher candidates:

<b>EDC 430 Assignments</b>	<b>Outcomes</b>	<b>Points</b>	<b>NCTM</b>	<b>RIPTS</b>
Active participation, ongoing professionalism in and out of class (includes membership in professional association)	Practice professional practices of teachers.	10	6, 7	10, 11
Reading Journal	Keep a record of your thoughts and feelings during the reading of the assigned book	10	6	10.2, 10.3
Unit Plan	Plan a series of cohesive, well-developed lessons in a team.	40	2, 3a-f	1-5 6.1, 6.2, 6.3, 6.4 7-9
Lesson Plan: Addressing the needs of all students through inquiry. And Launch presentation.	Plan and implement (if possible) <b>Inquiry-based</b> Lesson(s). Demonstrate knowledge of diversity and differentiation of instruction, including the use of concrete materials and/or models.	20	2, 3a-e	1-3 4.1, 4.2, 4.4 5 6.3, 6.4, 6.5, 6.6 8 9.2, 9.5 10.3

Lesson Plan: Teaching with Technology ( <i>included in Unit Plan</i> )	Plan and implement (if possible) lesson(s) where <b>students use technology</b> (e.g. graphing calculators, calculator based laboratories, Internet or iOS applets, Internet or iOS simulations).		2, 3a-e	1-3 5 6.3, 6.4, 6.5, 6.6 8 9.2, 9.5 10.3
NCTM Content Portfolio ( <i>Waived 2016-2017</i> )	Demonstrate your growth in the NCTM content standards by constructing a portfolio of selected best work.		1-7	2.1-2.5
Syllabus for Student Teaching	Demonstrate ability to plan, collaborate, and communicate effectively with cooperating teacher and students.	20	6-7	1 7 9.1 10.1
<b>Letter grade for 3 credits</b>		<b>100</b>		

<b>EDC 431 Assignments</b>	<b>Outcomes</b>	<b>Points</b>	<b>NCTM</b>	<b>RIPTS</b>
Participation, professionalism in and out of class (includes completion of 40+ hours of practicum experience. For high school only=40+ hours; for middle and high school 20+ hours at each setting)	Practice professional practices of teachers.	40	4, 6, 7a, c	1.3 10 11
TaskStream Assessments	Become familiar with and prepare and submit Taskstream E-folio Assessments.	20	1-7	6
Maintain a Reflective Field Log	Systematically reflect on teaching experiences to inform practice.	30	6	1.3 9.5 10
Cooperating teacher(s) and university supervisor's recommendation to student teach	Demonstrate each of the RIPTS and NCTM standards at an acceptable level.	10	6, 7	1-11
<b>S or U grade for 1 credit and permission to student teach</b>		<b>100</b>		

MTH 391 Assignments	Outcomes	Points	NCTM	RIPTS
School Report of Curriculum Organization, maps, and materials	Learn the school curriculum for at least one course or grade that you will be teaching at the practicum school.	40	3a, 6, 7c	2
Audit of Middle School or High School mathematics text series.	Learning to evaluate evidence in text series and make instructional decisions regarding mathematics text materials	60	3a, 6	2
<b>Letter grade for 1 credit</b>		<b>100</b>		

*Course and Practicum guidelines:*

1. Plan to attend all classes and practicum sessions. This course is a part of your professional preparation to teach, and as such, should be of the highest priority.
2. Part of being a professional teacher is *punctuality, attention to detail, and good communication*. Class meetings will consist of a lecture/laboratory format in which you will be expected to actively engage in all activities with your fellow teacher candidates. Much of what will occur during class meetings is the practicing of methods used for mathematics instruction. Because of this interactive character, it is very difficult to make up for missed classes. **Your attendance is a vital component of this course.** If you must be absent for class, please contact me prior to your absence or as soon possible based on the circumstance. It is my discretion to assess point deductions for absence (up to 5 points per absence) even when an absence is excused. Your professional communication and previous attendance and participation in class will be factored into my decision. Your attendance and engagement in class and practicum are an indicator of your readiness to student teach in the Spring 2017 semester and will be observed as part of my recommendation for you to student teach. Missing three or more classes severely diminishes your readiness for student teaching and may be grounds for failure of the course. Good communication can prevent a lot of difficulty in this area.
3. If you must be absent for practicum, you **MUST** contact your teacher directly, or if this is not possible, contact the school secretary with an urgent message before your absence. Next, please email me or call me to note your absence from practicum. If you were expected to teach a lesson, you must provide lesson plans to your teacher prior to your absence. You should plan to make up the missed practicum session as soon as possible.
4. See the URI inclement weather policy for information about cancelled classes at URI. Listen to local radio or TV station announcements about school closings/delays for your student teaching placement. Many radio stations also update delays and closings on their websites.
5. Be professional! The way you present yourself in class and at your student teaching placement(s) is a key way you demonstrate RIPTS standards 10 and 11. This includes your use of mobile devices. **Remember that you do not just represent yourself in the school(s). You represent URI and the mathematics education program. Your disposition paves the way for future students in the program. It can, of course, also close doors.**

*Revision policy:*

Each of the lesson plans and your unit plan can be revised for a possible grade change (including meeting and exceeding each criterion) if the following guidelines are followed:

1. Revised work is submitted no more than 1 week after instructor's written feedback is received (unless otherwise agreed). Late work will not be considered.
2. Professional responsibility and initiative are taken for the revision of the work (e.g., read and reflect on instructor feedback and conference with instructor).
3. Revision is submitted with new work as **well as original work and instructor's rubric rating**. I will not reconsider a re-assessment without all original materials.
4. Revision is original work of student.
5. No portion of the work has been submitted to another course for a grade or instructor feedback.

***Please note that I will be happy to provide you feedback on work in progress before it is due.***

*Reasonable Accommodations:* If you have a documented disability that may require individual accommodations, please make an appointment with me prior to the third class meeting and provide written documentation about your documented learning difference. We will discuss how to meet your individual learning needs to ensure your full participation in the course and to ensure fair and equitable assessment procedures. For further information or assistance, contact the staff at Disabilities Services for Students (Office of Student Life), 330 Memorial Union -874-2098.

*Respect for health, safety, and rights of self and others:*

The University of Rhode Island expects its students to treat other persons with respect and human dignity. All members of the community share the responsibility for protecting and maintaining community health, safety, and the rights of other persons. (Source: URI Student Handbook 2005-2007)

## Course Schedule, Topics, and Assignments

Date	Topic	Assignment Due
9/13	Course and people introductions Some paperwork Building a conceptual wall Standards (Common Core)	Blue: MTH 391 Orange: EDC 430 Green: EDC 431 <b>Praxis Scores, Valid BCI (copies)</b> <b>Due: Reading Journal Entry 0</b>
9/20 MTH 391	Inquiry-based Learning and Teaching: Launch Explore Summarize methodology Discuss Chapter 1 Chazan Discuss conceptual walls	Read Chazan: Coda (pp. 165-166), and then Introduction (xi-xvi), and Chapter 1 (pp. 1-36). <b>Due: Reading Journal Entry 1</b>
9/27 MTH 391	Learning and Teaching Algebra Brainstorming the Unit Plan	Read: CCSSM Algebra Standards.
10/4	Using technology and concrete materials to teach Algebra Discuss Chapter 2 Chazan	Read Chazan: Chapter 2 (pp. 37 -58) Read: CCSSM Mathematical Practices <b>Due: First Field Reflection</b> <b>Due: Reading Journal Entry 2</b>
10/11	Learning and Teaching Geometry: the Van Hiele levels of geometric thinking	Read: CCSSM Geometry Standards <b>Due: Inquiry Lesson Plan</b>
10/18 MTH 391	Using technology and concrete materials to teach Geometry Discuss Chazan Chapter 3	Read Chazan: Chapter 3 (pp. 59 -111) <b>Due: School Curriculum Report</b> <b>Due: Reading Journal Entry 3</b>
10/25 MTH 391	Mini Lessons	Each of you will present the Launch of your Inquiry lesson plan to the group (about 15 minutes). <b>Due: Unit Plan Outline</b>
11/1	The connections between teaching Algebra and Geometry; Trigonometry	Read: CCSSM Mathematical Modeling <b>Due: Second Field Reflection</b>
11/8	The connections between teaching Algebra and Geometry; Trigonometry Discuss Chazan Chapter 4	Read Chazan: Chapter 4 (pp. 112-147) <b>Due: Reading Journal Entry 4</b>
11/ 15	Number and Operations: fractions, decimals and percents; rate and ratio	Read: CCSSM Ratio/Proportion <b>Due: Curriculum Audit</b>
11/22	Number and Operations: fractions, decimals and percents; rate and ratio Discuss Chazan Chapter 5	Read Chazan: Chapter 5 (pp. 148-164) <b>Due: Reading Journal Entry 4</b>
11/29	Data and Probability	Read: CCSSM Data/Prob Standards
12/6	Unit Plan Presentations Preparing for the journey ahead: What are your learning goals for student teaching? What can you do to prepare yourself for student teaching? Student Teaching Certificates	<b>Due:</b> <b>Reading Journal Reflection</b> <b>Final Unit Plan</b> <b>Taskstream Assessments</b> <b>Third Field Reflection</b> <b>Student Teaching Syllabus</b> <b>Pre-Student teaching forms</b>
12/13	Final meeting	

## Course Evaluation

To determine grades for EDC 430, I will use scoring rubrics specifically designed for each assignment and task. Please note that up to 20% of assignment points may be deducted for poor grammar, spelling, and punctuation unless otherwise noted in the assignment. The following grading system is used to determine letter grades For EDC 430 and for MTH 391:

Grade	Points earned
A	93-100
A-	90-92
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C -	70-72
D	65-69
F	64 and lower

Grades for EDC 431 are Satisfactory (S) or Unsatisfactory (U) and determined by the university supervisor's assessment of the following: evidence of 40 hours of successful supervised practicum (with signed documentation from cooperating teacher(s)), successful implementation of lesson plans and other practicum responsibilities, and the designation "recommended for student teaching" from the university supervisor and cooperating teacher(s).



**Appendix A:** RIPTS and NCTM standards below are the standards that will be applied to YOU, the mathematics teacher candidate.

## **THE RHODE ISLAND PROFESSIONAL TEACHING STANDARDS (RIPTS)**

***Standard 1: Teachers create learning experiences using a broad base of general knowledge that reflects an understanding of the nature of the communities and world in which we live.***

*Teachers...*

- 1.1 reflect a variety of academic, social, and cultural experiences in their teaching
- 1.2 use a broad content knowledge base sufficient to create interdisciplinary learning experiences designed to ensure that all students achieve state standards for content and achievement
- 1.3 exhibit a commitment to learning about the changes in their disciplines and in our world that models a commitment to lifelong learning for students
- 1.4 facilitate student involvement in the school and wider communities

***Standard 2: Teachers have a deep content knowledge base sufficient to create learning experiences that reflect an understanding of central concepts, vocabulary, structures, and tools of inquiry of the disciplines/content areas they teach.***

*Teachers...*

- 2.1 know their discipline/content areas and understand how knowledge in their discipline/content area is created, organized, linked to other disciplines, and applied beyond the school setting
- 2.2 design instruction that addresses the core skills, concepts, and ideas of the disciplines/ content areas to help all students meet Rhode Island's learning standards
- 2.3 select appropriate instructional materials and resources (including technological resources) based on their comprehensiveness, accuracy, and usefulness for representing particular ideas and concepts in the discipline/content areas
- 2.4 engage students in a variety of explanations and multiple representations of concepts, including analogies, metaphors, experiments, demonstrations, and illustrations, that help all students develop conceptual understanding
- 2.5 represent and use differing viewpoints, theories, and methods of inquiry when teaching concepts and encourage all students to see, question, and interpret concepts from a variety of perspectives

***Standard 3: Teachers create instructional opportunities that reflect an understanding of how children learn and develop.***

*Teachers...*

- 3.1 understand how students use their prior knowledge to construct knowledge, acquire skills, develop habits of mind, and acquire positive dispositions toward learning
- 3.2 design instruction that meets the current cognitive, social and personal needs of their students
- 3.3 create age-appropriate lessons and activities that meet the variety of developmental levels of students within a class

***Standard 4: Teachers create instructional opportunities that reflect a respect for the diversity of learners and an understanding of how students differ in their approaches to learning.***

*Teachers...*

- 4.1 design instruction that accommodates individual differences (e.g., stage of development, learning style, English language acquisition, cultural background, learning disability) in approaches to learning
- 4.2 use their understanding of students (e.g., individual interests, prior learning, cultural background, native language, and experiences) to create connections between the subject matter and student experiences
- 4.3 seek information about the impact of students' specific challenges to learning or disabilities on classroom performance, and work with specialists to develop alternative instructional strategies to meet the needs of these students where appropriate
- 4.4 make appropriate accommodations and modifications for individual students who have identified learning differences or needs in an Individualized Educational Plan (IEP), 504 Accommodation Plan, Personal Literacy Plans (PLP's), or other approved school-based individualized learning plans (ILP's)

***Standard 5: Teachers create instructional opportunities to encourage all students' development of critical thinking, problem solving, performance skills, and literacy across content areas.***

*Teachers...*

- 5.1 design lessons that extend beyond factual recall and challenge students to develop higher level cognitive skills
- 5.2 pose questions that encourage students to view, analyze, and interpret ideas from multiple perspectives
- 5.3 make instructional decisions about when to provide information, when to clarify, when to pose a question, and when to let a student struggle to try to solve a problem
- 5.4 engage students in generating knowledge, testing hypotheses, and exploring methods of inquiry and standards of

evidence

5.5 use tasks that engage students in exploration, discovery, and hands-on activities

***Standard 6: Teachers create a supportive learning environment that encourages appropriate standards of behavior, positive social interaction, active engagement in learning, and self-motivation.***

*Teachers...*

6.1 use principles of effective classroom management to establish classrooms in which clear rules and standards of behavior are maintained

6.2 establish a safe, secure, and nurturing learning environment that supports the active engagement of all students

6.3 provide and structure the time necessary to explore important concepts and ideas

6.4 help students establish a classroom environment characterized by mutual respect and intellectual risk-taking

6.5 create learning groups in which all students learn to work collaboratively and independently

6.6 communicate clear expectations for achievement that allow all students to take responsibility and advocate for their own learning

***Standard 7: Teachers work collaboratively with all school personnel, families and the broader community to create a professional learning community and environment that supports the improvement of teaching, learning and student achievement.***

*Teachers...*

7.1 work collaboratively with colleagues to examine teacher practice, student work and student assessment results with the goal of improving instruction and achievement

7.2 develop relationships with students and their families to support learning

7.3 understand the role of community agencies in supporting schools and work collaboratively with them as appropriate

***Standard 8: Teachers use effective communication as the vehicle through which students explore, conjecture, discuss, and investigate new ideas.***

*Teachers...*

8.1 use a variety of communication strategies (e.g., listening, restating ideas, questioning, offering, counter examples) to engage students in learning

8.2 use a variety of modes of communication (e.g., verbal, visual, kinesthetic) to promote student learning

8.3 use technological advances in communication, including electronic means of collecting and sharing information, to enrich discourse in the classroom and the school

8.4 emphasize oral and written communication through the instructional use of discussion, listening and responding to the ideas of others and group interaction

8.5 seek knowledge of and demonstrate sensitivity to the particular communication needs of all students

***Standard 9: Teachers use appropriate formal and informal assessment strategies with individuals and groups of students to determine the impact of instruction on learning, to provide feedback, and to plan future instruction.***

*Teachers...*

9.1 select and/or design individual and group classroom assessments based on the strengths, limitations, and data provided by the assessments

9.2 identify and consider student and contextual variables that may influence performance so that a student's performance can be validly interpreted

9.3 systematically collect, synthesize, and interpret assessment results from multiple assessments to monitor, improve, and report individual and group achievement

9.4 provide students with opportunities and guidance to evaluate their own work and behavior against defined criteria and use the results of self-assessment to establish individual goals for learning

9.5 use assessment results to provide students with timely, helpful, and accurate feedback on their progress toward achievement goals

9.6 maintain records of student learning and communicate student progress to students, parents/ guardians, and other colleagues

9.7 use information from their assessment of students to reflect on their own teaching, to modify their instruction and to help establish professional development goals

***Standard 10: Teachers reflect on their practice and assume responsibility for their own professional development by actively seeking and participating in opportunities to learn and grow as professionals.***

*Teachers...*

10.1 solicit feedback from students, families, and colleagues to reflect on and improve their own teaching

10.2 explore and evaluate the application of current research, instructional approaches and strategies, including

technologies to improve student learning

10.3 take responsibility for their own professional development and improvement of their students' learning by participating in workshops, courses, or other individual and collaborative professional development activities that support their plans for continued development as teachers

10.4 take responsibility for learning about and implementing federal, state, district and school initiatives to improve teaching and learning

***Standard 11: Teachers maintain professional standards guided by legal and ethical principles.***

*Teachers...*

11.1 maintain standards that require them to act in the best interests and needs of students

11.2 follow school policy and procedures, respecting the boundaries of their professional responsibilities, when working with students, colleagues, and families

11.3 follow local, state, and federal law pertaining to educational and instructional issues, including regulations related to students', parents'/ guardians', and teachers' rights and responsibilities

11.4 interact with students, colleagues, parents, and others in a professional manner that is fair and equitable

11.5 are guided by codes of professional conduct adopted by their professional organizations

## **APPENDIX B**

### **CAEP/NCTM Program Standards (2012) Programs for Initial Preparation of Mathematics Teachers**

#### **Standard 1: Content Knowledge**

Effective teachers of secondary mathematics demonstrate and apply knowledge of major mathematics concepts, algorithms, procedures, connections, and applications within and among mathematical content domains.

Preservice teacher candidates:

**1a)** Demonstrate and apply knowledge of major mathematics concepts, algorithms, procedures, applications in varied contexts, and connections within and among mathematical domains (Number, Algebra, Geometry, Trigonometry, Statistics, Probability, Calculus, and Discrete Mathematics) as outlined in the *NCTM CAEP Mathematics Content for Secondary*.

#### **Standard 2: Mathematical Practices**

Effective teachers of secondary mathematics solve problems, represent mathematical ideas, reason, prove, use mathematical models, attend to precision, identify elements of structure, generalize, engage in mathematical communication, and make connections as essential mathematical practices. They understand that these practices intersect with mathematical content and that understanding relies on the ability to demonstrate these practices within and among mathematical domains and in their teaching.

Preservice teacher candidates:

**2a)** Use problem solving to develop conceptual understanding, make sense of a wide variety of problems and persevere in solving them, apply and adapt a variety of strategies in solving problems confronted within the field of mathematics and other contexts, and formulate and test conjectures in order to frame generalizations

**2b)** Reason abstractly, reflectively, and quantitatively with attention to units, constructing viable arguments and proofs, and critiquing the reasoning of others; represent and model generalizations using mathematics; recognize structure and express regularity in patterns of mathematical reasoning; use multiple representations to model and describe mathematics; and utilize appropriate mathematical vocabulary and symbols to communicate mathematical ideas to others.

**2c)** Formulate, represent, analyze, and interpret mathematical models derived from real-world contexts or mathematical problems.

**2d)** Organize mathematical thinking and use the language of mathematics to express ideas precisely, both orally and in writing to multiple audiences.

- 2e) Demonstrate the interconnectedness of mathematical ideas and how they build on one another and recognize and apply mathematical connections among mathematical ideas and across various content areas and real-world contexts.
- 2f) Model how the development of mathematical understanding within and among mathematical domains intersects with the mathematical practices of problem solving, reasoning, communicating, connecting, and representing.

### **Standard 3: Content Pedagogy**

Effective teachers of secondary mathematics apply knowledge of curriculum standards for mathematics and their relationship to student learning within and across mathematical domains. They incorporate research-based mathematical experiences and include multiple instructional strategies and mathematics-specific technological tools in their teaching to develop all students' mathematical understanding and proficiency. They provide students with opportunities to do mathematics – talking about it and connecting it to both theoretical and real-world contexts. They plan, select, implement, interpret, and use formative and summative assessments for monitoring student learning, measuring student mathematical understanding, and informing practice.

Preservice teacher candidates:

- 3a) Apply knowledge of curriculum standards for secondary mathematics and their relationship to student learning within and across mathematical domains.
- 3b) Analyze and consider research in planning for and leading students in rich mathematical learning experiences.
- 3c) Plan lessons and units that incorporate a variety of strategies, differentiated instruction for diverse populations, and mathematics-specific and instructional technologies in building all students' conceptual understanding and procedural proficiency.
- 3d) Provide students with opportunities to communicate about mathematics and make connections among mathematics, other content areas, everyday life, and the workplace.
- 3e) Implement techniques related to student engagement and communication including selecting high quality tasks, guiding mathematical discussions, identifying key mathematical ideas, identifying and addressing student misconceptions, and employing a range of questioning strategies.
- 3f) Plan, select, implement, interpret, and use formative and summative assessments to inform instruction by reflecting on mathematical proficiencies essential for all students.
- 3g) Monitor students' progress, make instructional decisions, and measure students' mathematical understanding and ability using formative and summative assessments.

### **Standard 4: Mathematical Learning Environment**

Effective teachers of secondary mathematics exhibit knowledge of adolescent learning, development, and behavior. They use this knowledge to plan and create sequential learning opportunities grounded in mathematics education research where students are actively engaged in the mathematics they are learning and building from prior knowledge and skills. They demonstrate a positive disposition toward mathematical practices and learning, include culturally relevant perspectives in teaching, and demonstrate equitable and ethical treatment of and high expectations for all students. They use instructional tools such as manipulatives, digital tools, and virtual resources to enhance learning while recognizing the possible limitations of such tools.

Preservice teacher candidates:

- 4a) Exhibit knowledge of adolescent learning, development, and behavior and demonstrate a

positive disposition toward mathematical processes and learning.

- 4b) Plan and create developmentally appropriate, sequential, and challenging learning opportunities grounded in mathematics education research in which students are actively engaged in building new knowledge from prior knowledge and experiences.
- 4c) Incorporate knowledge of individual differences and the cultural and language diversity that exists within classrooms and include culturally relevant perspectives as a means to motivate and engage students.
- 4d) Demonstrate equitable and ethical treatment of and high expectations for all students.
- 4e) Apply mathematical content and pedagogical knowledge to select and use instructional tools such as manipulatives and physical models, drawings, virtual environments, spreadsheets, presentation tools, and mathematics-specific technologies (e.g., graphing tools, interactive geometry software, computer algebra systems, and statistical packages); and make sound decisions about when such tools enhance teaching and learning, recognizing both the insights to be gained and possible limitations of such tools.

### **Standard 5: Impact on Student Learning**

Effective teachers of secondary mathematics provide evidence demonstrating that as a result of their instruction, secondary students' conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and application of major mathematics concepts in varied contexts have increased. These teachers support the continual development of a productive disposition toward mathematics. They show that new student mathematical knowledge has been created as a consequence of their ability to engage students in mathematical experiences that are developmentally appropriate, require active engagement, and include mathematics-specific technology in building new knowledge.

Preservice teacher candidates:

- 5a) Verify that secondary students demonstrate conceptual understanding; procedural fluency; the ability to formulate, represent, and solve problems; logical reasoning and continuous reflection on that reasoning; productive disposition toward mathematics; and the application of mathematics in a variety of contexts within major mathematical domains.
- 5b) Engage students in developmentally appropriate mathematical activities and investigations that require active engagement and include mathematics-specific technology in building new knowledge.
- 5c) Collect, organize, analyze, and reflect on diagnostic, formative, and summative assessment evidence and determine the extent to which students' mathematical proficiencies have increased as a result of their instruction.

### **Standard 6: Professional Knowledge and Skills**

Effective teachers of secondary mathematics are lifelong learners and recognize that learning is often collaborative. They participate in professional development experiences specific to mathematics and mathematics education, draw upon mathematics education research to inform practice, continuously reflect on their practice, and utilize resources from professional mathematics organizations.

Preservice teacher candidates:

- 6a) Take an active role in their professional growth by participating in professional development experiences that directly relate to the learning and teaching of mathematics.
- 6b) Engage in continuous and collaborative learning that draws upon research in mathematics education to inform practice; enhance learning opportunities for all students' mathematical

knowledge development; involve colleagues, other school professionals, families, and various stakeholders; and advance their development as a reflective practitioner.

- 6c) Utilize resources from professional mathematics education organizations such as print, digital, and virtual resources/collections.

### **Standard 7: Secondary Mathematics Field Experiences and Clinical Practice**

Effective teachers of secondary mathematics engage in a planned sequence of field experiences and clinical practice under the supervision of experienced and highly qualified mathematics teachers. They develop a broad experiential base of knowledge, skills, effective approaches to mathematics teaching and learning, and professional behaviors across both middle and high school settings that involve a diverse range and varied groupings of students. Candidates experience a full-time student teaching/internship in secondary mathematics directed by university or college faculty with secondary mathematics teaching experience or equivalent knowledge base.

Preservice teacher candidates:

- 7a) Engage in a sequence of planned field experiences and clinical practice prior to a full-time student teaching/internship experience that include observing and participating in both middle and high school mathematics classrooms and working with a diverse range of students individually, in small groups, and in large class settings under the supervision of experienced and highly qualified mathematics teachers in varied settings that reflect cultural, ethnic, linguistic, gender, and learning differences.
- 7b) Experience full-time student teaching/internship in secondary mathematics that is supervised by a highly qualified mathematics teacher and a university or college supervisor with secondary mathematics teaching experience or equivalent knowledge base.
- 7c) Develop knowledge, skills, and professional behaviors across both middle and high school settings; examine the nature of mathematics, how mathematics should be taught, and how students learn mathematics; and observe and analyze a range of approaches to mathematics teaching and learning, focusing on tasks, discourse, environment, and assessment.